

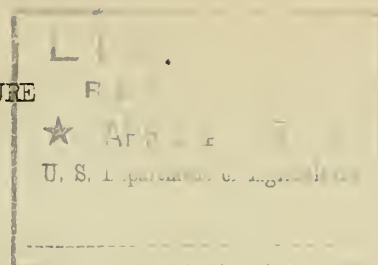
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UNITED STATES DEPARTMENT OF AGRICULTURE  
BUREAU OF HOME ECONOMICS  
WASHINGTON, D.C.



Reserve

STANDARDS FOR HOME REFRIGERATORS

(Adapted from Report on Refrigeration to the Committee on Fundamental Equipment of the President's Conference on Home Building and Home Ownership)

In selecting a refrigerator, the housewife's chief interest is suitable storage space at a satisfactory temperature range. Satisfactory temperatures may be obtained in home refrigerators by use of either ice or a mechanical unit. Performance in either case is determined by the cabinet in which the refrigerant is used and the handling of the refrigerant in that cabinet.

The amount of refrigerator space required by any family depends upon the size of the family, the marketing habits, and the amount of entertaining done. In general, the trend is toward a larger amount of food space per family when it can be afforded. A family of five, with a convenient source for purchasing supplies, needs approximately 6 cubic feet of food space, though less can be used if there is supplementary cool storage. The rural household requires larger space for food storage than the urban family because of less available supplies and the necessity during certain seasons of storing surplus foods.

The size of the cabinet should be stated plainly on its name plate in terms of cubic feet of usable food storage space. This is measured in ice refrigerators by subtracting from the total interior volume the space occupied by the ice compartment, the baffles, any space for air ducts, or any obstructions preventing use for food storage.

Usable food space in a mechanical cabinet is calculated by deducting the volume of the total space occupied by the cooling unit, including baffles (obtained by multiplying the distance from the inside top of the refrigerator to the bottom of the unit, by the maximum width of the unit, by the depth of the cabinet) from the total interior volume of the cabinet. If the unit contains a chilling tray the volume of this may be added to the usable space. Ice trays are not so included.

The cabinet should maintain satisfactory temperatures under standard conditions of operation. The milk compartment should maintain a temperature of 45° F or below and the average temperature of the food compartment should not exceed 50° F at any time.

Insulation

To maintain satisfactory temperatures without undue cost for refrigeration, a cabinet must be well insulated with insulation held firmly in place, of such form that it will not settle, and so installed as to make it as nearly as possible water and air proof. This is accomplished by tight inside and outside lining and by the use of waterproof cement to fasten the insulation to both walls.

Studies show that adequate insulation, while it increases the cost of the cabinet, materially decreases the cost of the refrigerant required to maintain standard temperatures.

### Construction of Cabinet

Framing must be rigid, and strong enough to support all the materials entering into the construction of the box and the refrigerant.

The inner lining should be smooth, easily cleaned, with rounded corners, and as nearly as possible water--- and air-tight. Porcelain lining is desirable. Where all porcelain is too expensive, an enamel lining with porcelain bottom is satisfactory. Galvanized iron linings are practically obsolete. Since the lining should not absorb either odors or moisture, wood is obviously ruled out.

The exterior should be smooth and easily cleaned, should maintain the original finish, and be water resistant. Experience of the past indicates that lacquered or enameled metal sheeting may deteriorate in climates where high temperature and humidity prevail. The preference at present is for porcelain exteriors, but a number of promising new materials are being developed.

Doors should fit tightly against gaskets held with pressure latches that hold securely. The better grade cabinets carry two gaskets per door. There should be a bearing surfact of at least one-half inch around each door, and a wider bearing surface is preferable. Doors should carry the same amount of insulation as the rest of the wall.

The hinges should be sufficiently strong to withstand the pressure. All hardware should be of good quality and nonrusting.

Shelves should be nontarnishable, strong, easily cleaned, and permit easy air movement. Sliding shelves are desirable for deep boxes. For stationary shelves hooks are better than grooves. Shelf spacing should provide for the foods logically stored on each. The shelf in the coldest portion of the small food compartment should be at least 10 inches high to accommodate milk bottles. Too great a distance between shelves decreases usable space.

Durability is important in determining cost and efficiency of operation, not only in decreasing the depreciation charge, but also the upkeep. If breathing spaces develop in the walls and the insulation slips or absorbs moisture, efficiency is lowered.

A drain is required in all cabinets cooled with ice. Some cabinets for mechanical installations are equipped with a drain to carry away the water resulting from defrosting; others are provided with a tray under the unit to collect this water. Since this tray serves to deflect air currents as well as to catch the drip during defrosting, the housewife should determine whether it should remain in place "between times".

The drainpipe should be short, straight, removable, and with a trap or an outside drain or plumbing connection. The box should be at least 10 inches off the floor to allow for ventilation, ease in cleaning, and access to drain when necessary.

### Cold Air Ducts and Baffles

In cabinets to be used with ice, proper precautions must be taken to insure adequate circulation over the ice and through every part of the box. This will not be accomplished without openings from the ice compartment to the food compartment and returns for the warm air to the ice compartment, and insulated baffles between ice and food storage compartments.

### Ice Chests

If the sum available for the purchase of a refrigerator is less than \$20.00, the use of an ice chest is recommended. An ice chest is inexpensive and has long been recognized as having a higher degree of efficiency than the cheaper refrigerator.

When purchasing an efficient ice-cooled chest, the customer should be sure that the walls contain at least 1 1/2 inches of a recognized insulator, that the inside lining is of heavy galvanized iron, that a metal rack on the floor allows at least 1 1/2 inches of unobstructed space below it for air movement, and that the ice compartment located at one end has a wall of heavy corrugated metal extending from about 2 inches below the top to about 2 inches above the rack on the bottom. There should be a drain with a water seal.

### Refrigerators

As the amount of money available for purchase of a refrigerator increases, cabinets suited to the size of the family and its budget can be intelligently selected on the basis of cost, available food space, ice meltage, durability, and appearance.

The better the grade of the cabinet the larger the space a given weight of ice will cool. Or, stated inversely, the ice compartment takes up a smaller proportion of the total cubic volume in well-insulated boxes. This has been proposed as a means of grading or grouping boxes into three classes on the basis of amount of space a given weight of ice will cool. Any cabinet to be graded must maintain satisfactory temperatures. In the table below the dimensions of boxes built to hold 50, 75, and 100 pounds of ice are shown for the three suggested grades.

## Food capacity and ice capacity in classified refrigerators

Amount of ice.	Grade A	Grade B	Grade C
	Minimum food space	Minimum food space	Minimum food space
Pounds	Cubic feet	cubic feet	cubic feet
100	8	6	5
75	6	5	4
50	5	4	3.5

The higher price of an A grade box may be justified on the basis of lower ice meltage and durability. A standard box of A grade under test in the laboratory of the Bureau of Home Economics for a period of 5 years gives the same performance now that it did at the beginning of the test period.

## Mechanical Refrigeration

Ice placed in a refrigerator absorbs heat by melting -- changing from a solid to a liquid at a low temperature. Mechanical units operate on the principle that certain substances known as refrigerants, such as sulphur dioxide and ammonia, absorb heat in vaporizing -- changing from a liquid to a gas -- at a low temperature. By forcing the refrigerant to vaporize inside the chamber to be cooled and then changing it back to a liquid outside of that chamber and forcing it to flow back to vaporize again, continuous refrigeration is possible.

During the past 5 years there has been considerable activity in the development of mechanical units to provide refrigeration. The earlier units were, many of them, installed in existing cabinets. The industry soon recognized that the service of its unit was largely controlled by the cabinet and in practically all jobs now intended for home installation the units are self-contained in cabinets tested by the manufacturers and the units are installed and tested before leaving the factory.

## Types of Units

These units are of two general types, the compression type and the absorption type. In the compression type machine the refrigerant is put under pressure in a mechanical compressor run by a motor.

The absorption type unit makes use of a small boiler to vaporize and thereby raise the pressure of the refrigerant which is changed back to a liquid at ordinary temperature.

## Selecting a Mechanical Refrigerator

In selecting a mechanical refrigerator the committee recommends that the consumer consider first the reliability of the manufacturer; second that local servicing of a reliable character is available for the unit selected.

The Machine. 1/ "Since it is extremely difficult for the layman to judge the technical points of a refrigerating machine, his best criterion is the reliability of the manufacturer and agent. Several manufacturers have been making and selling electric refrigerators for a number of years and their machines have proved commercially satisfactory. In buying a machine the purchaser should inquire how long the manufacturer has been in business, how many machines of the model under consideration have been sold, how long they have been in use, and how many are in use in the immediate vicinity or city. He should ascertain the facilities available for emergency service and maintenance work in case the machine needs attention. Sometimes the reliability and business integrity of the local selling agent, his ability to render prompt service when needed -- for example, on Sundays and holidays, as well as week days -- will be of first importance in making a selection...The older, better known machines are about on a par and of equal merit.

"In the case of newer machines which have not been on the market long enough to meet the test of time, the manufacturer should be of such financial strength and business integrity as to leave no doubt of his ability to make good in marketing a new device."

### Cost of Operation

It is also recommended that the customer observe a refrigerator cabinet of the same type during operations, and get from the dealer a statement as to temperature maintained and cost in power for operation under test conditions.

### Capacity of Machine as Indicated by Time of Operation

It is of importance to find out whether the units purchased have sufficient capacity to keep the refrigerator at the desired temperature without operating under normal and average conditions over 50 percent of the time. The number of ice cubes and the time required for freezing desserts, if this convenience is desired, should be ascertained before purchase.

It is to be especially emphasized that in mechanical as in ice refrigeration the cost of operation depends upon the construction of the cabinet and its insulation. It also should be borne in mind that the performance will vary with the food load, the frequency of opening the doors, the use of the freezing unit, the location of the refrigeration cabinet with reference to surrounding temperature, and the ventilation of the condenser if an air condenser is a part of the unit.

1/ Miller, G.E. "Electrical Refrigeration for the Home," Journal of Home Economics, June, 1926.

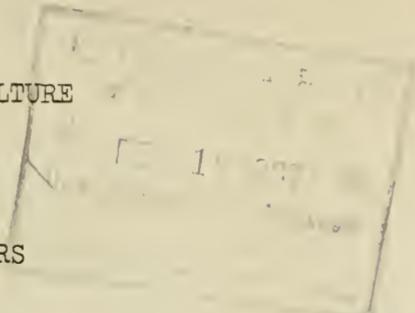
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#### Name Plate

The committee recommends that all ice chests and refrigerators carry name plates which give information covering the amount of usable food storage space in cubic feet, the temperature of the milk compartment and the average for the food compartment, with a statement of the test temperature, and the amount of the refrigerant required to give this performance.

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